

RESEARCH & DEVELOPMENT

Machines & Components

Multi-mode TBM

> **MH Box Machine**

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E-Power Pipe

ISP

Mud pump monitoring system

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 **MH Box Machine**

MH Box Machine

An efficient tunnelling concept for crossing beneath traffic arteries

The demand for new underground infrastructures for pedestrians and cyclists is increasing along with the rapidly growing traffic load in large and megacities. This makes it necessary to cross beneath a great number of busy junctions, expressways or railway routes at short distances and at a low depth. The high traffic burden at these intersections makes aboveground interventions extremely difficult or even impossible without a great deal of additional work and expense.



The newly developed **MH Box Machine** allows for rectangular crossings to be built without major impacts on traffic and environment.

An intelligent modification of the tried-and-tested partial-face excavation technology

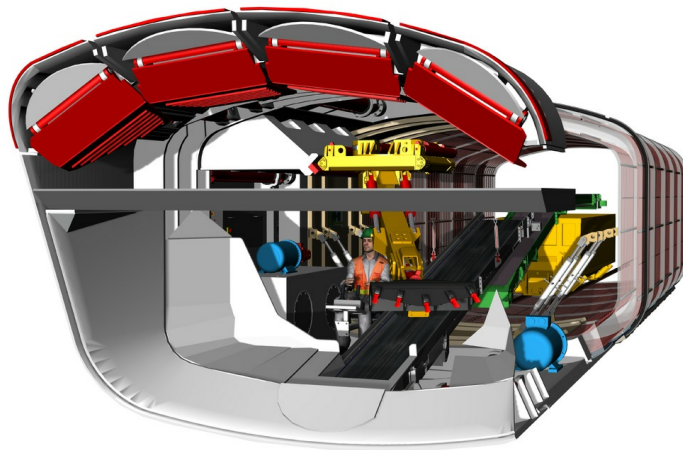
Against the backdrop of the abovementioned challenge, Herrenknecht has developed the so-called MH Box Machine as a solution. It is a further development of the MH partial-face excavation technology that has been used successfully for more than 35 years. These machines have established themselves as the most efficient tunnelling equipment when building tunnels and pipelines above groundwater level, because of their simple design, low acquisition and operating costs and excellent performances.

The technology has now been especially adapted for short crossings beneath traffic arteries and combined with tried-and-tested construction methods. The newly developed, rectangular profile of the shield skin ideally meets the requirements of a pedestrian tunnel. As compared to a round profile unnecessary excavation of earth can be avoided. At the same time, the tunnel can be built much closer to the surface which means that afterwards pedestrians have to walk only a few number of stairs when crossing. The stability of the overall structure is clearly increased by the rounded corners and the slight bulge of floor and ceiling.

A tried-and-tested excavation concept with a movable excavator arm

A hydraulic, telescopic excavator arm that can be pivoted both horizontally and vertically loosens the soil at the tunnel face and transports it to the belt conveyor. The excavated material is then being transported to the muck cars that remove the material. Depending on the lining method, either hydraulic jacking cylinders or a jacking frame in the launch shaft press the machine forward at the same time. The steel-coated shield supports the cavity created during the entire tunnelling process until it is secured and lined. The shield section is connected to the machine body by hydraulic short-stroke cylinders. This makes it possible to steer the machine precisely along a given alignment.

A range of measures such as the installation of a support platform or telescopic face plates in the ridge area reduce the repose angle of the geology and avoid uncontrolled slacking efficiently.



The MH Box Machine excavates the soil using a hydraulically movable excavator arm as it is the case with conventional MH machines.

Individual lining methods for individual project requirements

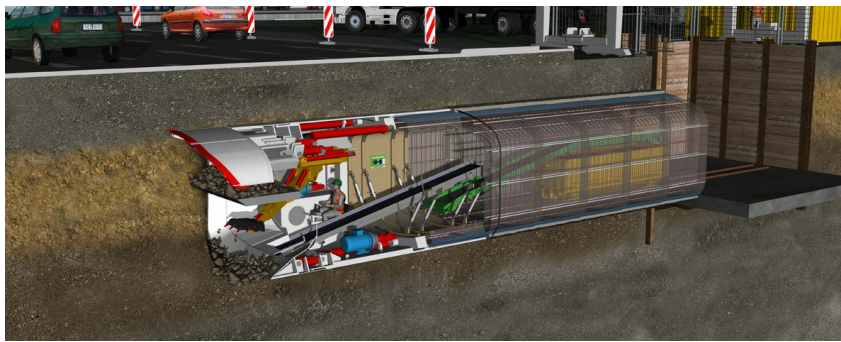
For mechanized tunnelling with the newly designed MH Box technology two methods are generally available to line the tunnel: pipe jacking or in-situ concrete.

About six meters of tunnel can be produced a day with the conventional pipe jacking method, which works by pushing forward prefabricated pipe segments behind the tunnelling machine using hydraulic jacks in the launch shaft. As usual in pipe jacking, the intermediate pipe joints are dampened by a wooden insert and sealed with rubber profile gaskets.

The so-called in-situ monolith lining is the second option. With this method, the hydraulic jacks in the machine body are retracted after each stroke of two meters to allow the tunnel to be lined with in-situ concrete. First of all, the cavity is lined with a damp-resistant foil and then longitudinal reinforcements and steel mats are mounted on to it. Concrete is then pumped through openings in the mobile inner shuttering mould. This makes it possible to leave out rain gutters in the invert already at that stage, for example. After hardening, the jacks brace against the new tunnel section for the next stroke. Despite the relatively complex lining procedure, this method provides for tunnelling performances of one to two meters a day.

Both lining methods only need two shafts at the surface and small job site installation for the

construction work. This means that traffic can go on almost without interruption.



Lining method with in-situ concrete directly behind the machine.

High safety even with low overburdens

Due to the adjusted profile form of the MH Box technology, the crossings needed can be ideally built very close to the surface. Special safety measures prevent the surface from moving along with the jacks and stabilize it at the same time. One safety measure is to install a steel pipe or bulkhead arch that supports the surface, making it possible to cross beneath a highly frequented traffic artery without problem. The complete shield of the MH Box Machine can also be designed as a so-called poling plate system. Steel plates are extended forward which adjust the repose angle to the geology and stabilize the tunnel face as well. For monolith lining, a simple load bridge can be installed as a supplementary feature. It has hardly any impact on the traffic and compensates for the load of the vehicles until the concrete has completely dried and the tunnel is fully resilient.

The MH Box Machine newly designed by Herrenknecht is an efficient solution to quickly and safely build short crossings beneath obstacles such as roads or railway routes close to the surface. The flexible choice of the lining method and the safety measures at the surface make it possible to adapt to the conditions on site and to carry out a great number of projects efficiently.

ADVANTAGES AT A GLANCE	
<ul style="list-style-type: none">› Minimum impact on the traffic› High tunnelling performances thanks to tried-and-tested machine technology› Low quantities of excavated material due to adjusted profile form› Different lining methods with individual safety options available› Small job site footprint› Minimum operating costs thanks to simple machine technology	